

WHAT IS CLAIMED IS:

1. A liquid crystal display device, comprising:
 - a first substrate having an inner surface;
 - a second substrate having an inner surface, wherein the inner surface of the second substrate faces and is spaced apart from the inner surface of the first substrate;
 - a light absorption layer arranged on the inner surface of the first substrate;
 - a cholesteric liquid crystal color filter (CCF) layer arranged on the light absorption layer, wherein the CCF layer selectively reflects light having a wavelength range corresponding to one of red, green, and blue colors;
 - a first transparent electrode arranged on the CCF layer;
 - a first orientation film arranged on the first transparent electrode;
 - a second transparent electrode arranged on the inner surface of the second substrate;
 - a second orientation film arranged on the second transparent electrode, wherein the first and second orientation films have substantially identical orientation directions;
 - a polarizing plate arranged on an outer surface of the second substrate; and
 - a layer of liquid crystal material arranged between the first and second orientation films, wherein the layer of liquid crystal material includes a plurality of liquid crystal molecules having a substantially symmetrical orientation about a mid-point between the first and second orientation films.
2. The device according to claim 1, wherein the polarizing plate includes a linear polarizer.
3. The device according to claim 1, further comprising:
 - an array element layer arranged over the inner surface of the second substrate, wherein

the array element layer includes:

- a gate line;
- a data line crossing the gate line; and
- a thin film transistor connected to the gate line and the data line.

4. The device according to claim 3, wherein the array element layer is arranged between the inner surface of the second substrate and the second transparent electrode.
5. The device according to claim 1, further comprising a compensating film arranged between the outer surface of the second substrate and the polarizing plate.
6. The device according to claim 1, wherein the layer of liquid crystal material functions in an optically compensated birefringence (OCB) mode and the plurality of liquid crystal molecules have the substantially symmetrical orientation in the presence of a voltage applied to the layer of liquid crystal material.
7. The device according to claim 6, wherein the applied voltage is between a minimum voltage and a maximum voltage.
8. The device according to claim 7, wherein the maximum voltage is greater than a threshold voltage of the layer of liquid crystal material.
9. The device according to claim 7, wherein the layer of liquid crystal material has a first retardation value of $3\lambda/4$ when the applied voltage is substantially equal to the minimum voltage.

10. The device according to claim 7, wherein the layer of liquid crystal material has a second retardation value of $\lambda/4$ when the applied voltage is substantially equal to the maximum voltage.
11. The device according to claim 7, wherein the minimum voltage is substantially equal to a threshold voltage of the layer of liquid crystal material.
12. The device according to claim 7, wherein the minimum voltage is between about 1.0 V and about 1.5 V.
13. The device according to claim 7, wherein the maximum voltage is between about 4.0 V and about 5.0 V.
14. The device according to claim 1, wherein the first transparent electrode includes a common electrode.
15. The device according to claim 1, wherein the second transparent electrode includes a pixel electrode.
16. A liquid crystal display device, comprising:
- a first substrate having an inner surface;
 - a second substrate having an inner surface, wherein the inner surface of the second substrate faces and is spaced apart from the inner surface of the first substrate;
 - a first polarizing plate arranged on an outer surface of the first substrate;

a cholesteric liquid crystal color filter (CCF) layer arranged on the inner surface of the first substrate, wherein the CCF layer selectively transmits light having a wavelength range corresponding to one of red, green, and blue colors;

a first transparent electrode arranged on the CCF layer;

a first orientation film arranged on the first transparent electrode;

a second transparent electrode arranged on the inner surface of the second substrate;

a second orientation film arranged on the second transparent electrode, wherein the first and second orientation films have substantially the same orientation directions;

a second polarizing plate arranged on an outer surface of the second substrate;

a layer of liquid crystal material arranged between the first and second orientation films, wherein the layer of liquid crystal material includes a plurality of liquid crystal molecules having a substantially symmetrical orientation about a mid-point between the first and second orientation films; and

a backlight unit arranged under the first polarizing plate.

17. The device according to claim 16, wherein the first polarizing plate includes cholesteric liquid crystal (CLC) material for selectively reflecting one of left-handed and right-handed circularly polarized light of all wavelengths.

18. The device according to claim 16, wherein the second polarizing plate includes a linear polarizer.

19. The device according to claim 16, further comprising:

an array element layer arranged over the inner surface of the second substrate, wherein the array element layer includes:

a gate line;
a data line crossing the gate line; and
a thin film transistor connected to the gate line and the data line.

20. The device according to claim 19, wherein the array element layer is arranged between the inner surface of the second substrate and the second transparent electrode.

21. The device according to claim 16, further comprising a compensating film arranged between the outer surface of the second substrate and the second polarizing plate.

22. The device according to claim 16, wherein the layer of liquid crystal material functions in an optically compensated birefringence (OCB) mode and the plurality of liquid crystal molecules have the substantially symmetrical orientation in the presence of a voltage applied to the layer of liquid crystal material.

23. The device according to claim 22, wherein the applied voltage is between a minimum voltage and a maximum voltage.

24. The device according to claim 23, wherein the maximum voltage is greater than a threshold voltage of the layer of liquid crystal material.

25. The device according to claim 23, wherein the layer of liquid crystal material has a first retardation value of $3\lambda/4$ when the applied voltage is substantially equal to the minimum voltage.

26. The device according to claim 23, wherein the layer of liquid crystal material has a second retardation value of $\lambda/4$ when the applied voltage is substantially equal to the maximum voltage.
27. The device according to claim 23, wherein the minimum voltage is substantially equal to a threshold voltage of the layer of liquid crystal material.
28. The device according to claim 23, wherein the minimum voltage is between about 1.0 V and about 1.5 V.
29. The device according to claim 23, wherein the maximum voltage is between about 4.0 V and about 5.0 V.
30. The device according to claim 16, wherein the CCF layer includes:
- a first sub-CCF layer for selectively reflecting light having a wavelength range corresponding to one of a red, green, or blue color; and
 - a second sub-CCF layer for selectively reflecting light having a wavelength range corresponding to another one of a red, green, or blue color, different from the color selectively reflected by the first sub-CCF layer.
31. The device according to claim 16, wherein the first transparent electrode includes a common electrode.
32. The device according to claim 16, wherein the second transparent electrode includes a pixel electrode.

33. A liquid crystal display device, comprising:

- a first substrate having an inner surface;
- a second substrate having an inner surface, wherein the inner surface of the second substrate faces and is spaced apart from the inner surface of the first substrate;
- a cholesteric liquid crystal color filter (CCF) layer arranged between the first and second substrates; and
- a layer of liquid crystal material arranged between the CCF layer and the second substrate, wherein the layer of liquid crystal material has a first retardation value of $3\lambda/4$ in the presence of a first applied voltage and a second retardation value of $\lambda/4$ in the presence of a second applied voltage.

34. The device of claim 33, wherein the second applied voltage is greater than the first applied voltage.

35. The device of claim 33, wherein the first applied voltage is substantially equal to a threshold voltage of the layer of liquid crystal material.

36. The device of claim 33, wherein the first applied voltage is between about 1.0 V and about 1.5 V.

37. The device of claim 33, wherein the second applied voltage is between about 4.0 V and about 5.0 V.

38. The device of claim 33, wherein the CCF layer selectively reflects light having a wavelength range corresponding to one of red, green, and blue colors.

39. The device of claim 38, wherein the CCF layer selectively reflects left-handed circularly polarized light.

40. The device of claim 33, wherein the CCF layer selectively transmits light having a wavelength range corresponding to one of red, green, and blue colors.

41. The device of claim 40, wherein the CCF layer includes:

 a first sub-CCF layer for selectively reflecting light having a wavelength range corresponding to one of a red, green, or blue color; and

 a second sub-CCF layer for selectively reflecting light having a wavelength range corresponding to another one of a red, green, or blue color, different from the color selectively reflected by the first sub-CCF layer.

42. The device of claim 41, wherein the first and second sub-CCF layer selectively reflect left-handed circularly polarized light.

43. The device of claim 33, further including a light absorption layer arranged between the CCF layer and the first substrate.

44. The device of claim 43, wherein the light absorption layer includes a black resin.

45. The device of claim 33, further including a first polarizing plate arranged on an outer surface of the first substrate.
46. The device of claim 45, wherein the first polarizing plate includes cholesteric liquid crystal (CLC) material for selectively reflecting right-handed circularly polarized light of all wavelengths.
47. The device of claim 45, wherein the first polarizing plate includes cholesteric liquid crystal (CLC) material for selectively transmitting left-handed circularly polarized light of all wavelengths.
48. The device of claim 33, further including a second polarizing plate arranged on an outer surface of the second substrate.
49. The device of claim 48, wherein the second polarizing plate includes a linear polarizer.
50. The device of claim 49, wherein the linear polarizer has a polarizing axis of about 0° .
51. The device of claim 49, wherein the linear polarizer has a polarizing axis of about 90° .
52. The device of claim 48, further including a compensating film arranged between the outer surface of the second substrate and the second polarizing plate.
53. The device of claim 52, wherein the compensating film includes a biaxial film for widening a viewing angle of the liquid crystal display device.

54. The device of claim 33, further including:

a first transparent electrode arranged between the CCF layer and the layer of liquid crystal material; and

a second transparent electrode arranged between the layer of liquid crystal material and second substrate.

55. The device of claim 54, wherein the first transparent electrode includes a common electrode.

56. The device of claim 54, wherein the second transparent electrode includes a pixel electrode.

57. The device of claim 54, further including:

a first orientation layer arranged between the layer of liquid crystal material and the first transparent electrode; and

a second orientation layer arranged between the layer of liquid crystal material and the second transparent electrode.

58. The device of claim 57, wherein the first and second orientation layers have substantially the same orientation direction.